REMARKS

Applicant notes with appreciation that dependent claim 5 has been recognized as reciting allowable subject matter. Applicant respectfully requests reconsideration of the subject application in view of the amendments and remarks set forth herein.

1. Status of the Claims

Claims 1-4 and 6-11 have been rejected. Claim 5 is objected to, but is indicated as allowable if rewritten to include the limitations of the base claim and any intervening claims.

Claim 1 is amended herein. No new matter is added by these amendments. After entry of the foregoing amendments, claims 1-11 are pending in this application.

2. 35 USC § 112 Rejections

The outstanding Office Action sets forth rejections under 35 USC § 112 as follows:

Claims 1-11 are rejected under 35 USC § 112, 1st paragraph, as failing to comply with the written description requirement.

In view of the amendments to claim 1 set forth herein, applicant respectfully traverse the §112 rejections. Reconsideration of the foregoing §112 rejections is respectfully requested.

More particularly, independent claim 1, as amended, overcomes the Examiner's rejections under §112. In addition, applicant respectfully submits that claims 2-11, which depend directly or indirectly from claim 1, comply with the requirements of §112 for at least the reasons noted with respect to claim 1.

3. Rejections Under 35 USC § 102(b)

The outstanding Office Action sets forth rejections under 35 USC § 102(b) as follows:

Claims 1, 2, 6, 7 and 11 are rejected under 35 USC § 102(b) as being anticipated by Grethe et al. (U.S. Patent No. 4,698,014) [hereinafter "Grethe"]. Applicant respectfully traverses the Section 102(b) rejections and reconsideration of the foregoing Section 102 rejections is respectfully requested.

According to the MPEP, "[t]o anticipate a claim, the reference must teach every element of the claim." (See, e.g., MPEP § 2130). "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art

reference." Verdegall Bros. v. Union Oil Co. of California, 814 F.2d 628, 631; 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

Applicant respectfully traverses the § 102 rejections based upon Grethe. Applicant respectfully submits that Grethe fails to anticipate the rejected claims because, at a minimum, Grethe does not describe "each and every element" thereof. Contrary to the Examiner's characterization, Grethe lacks at least "at least one secondary upper layer that substantially follows a second flow path radially inwardly towards said central axis, wherein said primary lower layer and said secondary upper layer interact and support each other in a non-destructive manner from peripheral side wall to said outlet," as recited in independent claim 1. That is, the primary lower layer and secondary upper layer, as recited in applicant's claim 1, interact and support each other in a non-destructive manner within the same circular chamber from the peripheral side wall of the chamber to the outlet of the chamber.

In distinct contrast, Grethe teaches that an atomizing medium flow enters a chamber 3 through inlet 4, while a fuel supply flow through inlet line 9 is not introduced in the same chamber 3, but rather the fuel flow is introduced into the discharge nozzle 14, where the fuel flow first comes into contact with the atomizing medium flow. (See, e.g., Grethe at col. 4, lines 46-49 and 62-65; col. 5, lines 23-30). In particular, Grethe teaches that the "fuel enters the annular gap 7 and flows as a continuous film onto the inner wall of the nozzle as far as the knife-edge configuration 6c, where it is atomized under the influence of the atomizing medium stream that is flowing into the nozzle from the preliminary nozzle chamber [3]." (Grethe at col. 5, lines 24-29). In short, Grethe's fuel flow is guided onto an inner wall of the discharge nozzle as a film, and the swirling action of the atomizing flow causes the fuel to be roughly atomized.

Grethe's two flows are not primary and secondary layers that interact and **support** each other in a non-destructive manner **from** peripheral side wall to an outlet. In distinct contrast, Grethe's two flows are not even in the same chamber. Rather, Grethe's two flows first come into contact and are mixed with each other in the discharge nozzle. Moreover, Grethe's two flows do not "support each other in a non-destructive manner **from** peripheral side wall to an outlet." Thus, Grethe's atomizing medium stream flow and fuel flow do not "interact and support each other in a non-destructive manner" within the same circular chamber from the "peripheral side wall" of the chamber to the outlet of the chamber, as recited in applicant's claim 1.

Moreover, Grethe's fuel flow is only radial relative to the central axis when it is traveling inwardly along channel 8. (See Grethe, Fig. 1 and the associated text). However, when Grethe's fuel flow reaches gap 7, the fuel flow begins to travel axially as a film along faces 6a and 6c. Thus, Grethe's fuel flow is traveling axially when it interacts in the nozzle with the atomizing medium flow, and is not traveling "substantially . . . radially inwardly towards said central axis, wherein said primary lower layer and said secondary upper layer interact" as recited in applicant's independent claim 1.

Additionally, the diameter of applicant's chamber 1 is relatively large when compared to the height of the chamber (generally in a ratio greater than 8:1). The overall height of the side wall 3 (see, e.g., applicant's FIG. 4) of the circular chamber is typically made up of the addition of the height of side wall 12 and the width of gap 13, which is the horizontal layer directly above side wall 12 (best seen in applicant's FIG. 7). In terms of overall height, the width of gap 13 is generally less than 18% of the overall height of side wall 3, i.e., the side wall 12 component is generally greater than 82% of that height. The two layers established within applicant's chamber (i.e., the primary lower layer and the secondary upper layer) substantially fill the whole chamber, the primary lower layer generally having a thickness substantially equivalent to the height of side walls 12 and the secondary upper layer 17 generally having a thickness substantially equivalent to the width of the gap 13. As shown in applicant's FIGs. 4, 8 and 12, the primary lower layer 16 is established substantially tangentially by the inlets 11 and the side walls 12 and generally makes up approximately 82% of the two layers, while the radial flow secondary upper layer (approximately less than 18% of the two layers) is established by the gap 13. See, e.g., applicant's FIG. 12B for a depiction of the relative thickness of the two layers within applicant's chamber. The spray characteristics of applicant's apparatus are generally determined by the width of gap 13, as it sets the magnitude of the secondary upper (control) layer as recited in the present application. Thus, both of applicant's primary lower layer 16 and the secondary upper layer 17 are formed and support each other in a non-destructive manner **within the same circular chamber** (in distinct contrast to the teachings of Grethe).

For at least the foregoing reasons, Grethe fails to teach or suggest "at least one secondary upper layer that substantially follows a second flow path radially inwardly towards said central axis, wherein said primary lower layer and said secondary upper layer interact and support each other in a non-destructive manner from peripheral side wall to said outlet," as recited in

independent claim 1. Thus, applicant respectfully submits that independent claim 1 patentably distinguishes over Grethe.

Moreover, Grethe does not teach or suggest an apparatus that includes (i) "an inlet at or near said peripheral side wall to allow a flow of fluid to enter said chamber substantially tangential to said peripheral side wall;" and (ii) "an outlet exiting through one of said end walls wherein in use a flow of fluid entering through said inlet has a primary lower layer that substantially follows a first circular flow path which forms a vortex commencing at or near said peripheral side wall and increases in velocity and pressure towards said outlet," as recited in independent claim 1.

In distinct contrast, while Grethe teaches that the atomizing medium line 4 communicates with the chamber 3 via a tangential component, the flow of Grethe's atomizing medium is not "substantially tangential" to a peripheral side wall. (See Grethe at col. 4, lines 9-13). As best seen in FIGs. 2 and 4 of the Grethe reference, the flow via inlet 4 or 13 is offset a considerable distance from the side of the chamber 3, and thus is not configured to establish a substantially tangential flow. In contrast to applicant's claim 1 and applicant's FIG. 8, Grethe's flow entering from inlet 4 could not follow a substantially tangential path at or near a peripheral side wall, because the centerline of Grethe's flow is substantially offset, and because the diameter of inlet 4 is considerable when compared to the overall diameter of chamber 3. Additionally, flow entering Grethe's inlet 4 would break down rather than follow a substantially tangential path, and would not create/form a vortex. More particularly, Grethe's flow of the atomizing medium in the chamber 3 does not create or "form a vortex," as recited in applicant's claim 1. In distinct contrast, Grethe teaches the apparatus is configured to stabilize the flame by "swirling," but Grethe does not establish a vortex effect. (See Grethe at col. 4, lines 48-49). Nowhere in the cited Grethe reference is there a mention of forming a vortex and/or of creating a vortex effect.

In distinct contrast and as best seen in applicant's FIG. 8, applicant's apparatus utilizes a plurality of side walls 12, each of which extend into the circular chamber near the peripheral side wall 3 of chamber 1, that establish the tangential flow of the present disclosure. As shown in applicant's FIGs. 5-8, the side walls 12 are substantially straight (flat) walls. Additionally and as shown in applicant's FIG. 8, the cross-section of the inlet ports 11 have a rectangular configuration. It is this rectangular configuration and the extent of the side walls 12 into

chamber 1 which allow for the flow to enter the chamber substantially tangential to the peripheral side wall. In distinct contrast, the apparatus of Grethe does not and cannot achieve this.

Thus, Grethe fails to teach or suggest (i) "an inlet at or near said peripheral side wall to allow a flow of fluid to enter said chamber substantially tangential to said peripheral side wall;" and (ii) "an outlet exiting through one of said end walls wherein in use a flow of fluid entering through said inlet has a primary lower layer that substantially follows a first circular flow path which forms a vortex commencing at or near said peripheral side wall and increases in velocity and pressure towards said outlet," as recited in independent claim 1.

For at least the foregoing reasons, applicant respectfully submits that independent claim 1 patentably distinguishes over Grethe. Claims 2, 6, 7 and 11 are dependent, either directly or indirectly, upon claim 1 and thus are allowable for at least the reasons noted herein with respect to independent claim 1. Reconsideration and withdrawal of the outstanding Section 102(b) rejections based on Grethe is respectfully requested.

4. Rejection Under 35 USC § 103(a)

The outstanding Office Action also sets forth rejections under 35 USC §103(a) as follows:

Claims 3, 4, 9 and 10 are rejected under 35 USC §103(a) as being unpatentable over Grethe in view of Perera (U.S. Patent No. 5,197,517) [hereinafter "Perera"]; and claim 8 is rejected under 35 USC §103(a) as being unpatentable over Grethe in view of Perera and further in view of Jacob (U.S. Patent No. 5,054,474) [hereinafter "Jacob"]. Applicant respectfully traverses the Section 103(a) rejections. Reconsideration of the foregoing Section 103 rejections is respectfully requested.

Regarding claims 3, 4, 9 and 10, the Examiner asserts that Grethe teaches all the limitations of the claims except for a disc engageable with a spray nozzle housing, which the Examiner asserts is disclosed by Perera. Applicant respectfully disagrees.

For at least the foregoing reasons noted with respect to independent claim 1, Grethe fails to teach or suggest (i) "at least one secondary upper layer that substantially follows a second flow path radially inwardly towards said central axis, wherein said primary lower layer and said

secondary upper layer interact and support each other in a non-destructive manner from peripheral side wall to said outlet;" (ii) "an inlet at or near said peripheral side wall to allow a flow of fluid to enter said chamber substantially tangential to said peripheral side wall;" and (iii) "an outlet exiting through one of said end walls wherein in use a flow of fluid entering through said inlet has a primary lower layer that substantially follows a first circular flow path which forms a vortex commencing at or near said peripheral side wall and increases in velocity and pressure towards said outlet," as recited by applicant's independent claim 1. Claims 3, 4, 9 and 10 are dependent, either directly or indirectly, upon claim 1 and thus are allowable for at least the reasons noted herein with respect to independent claim 1. For at least the foregoing reasons, Applicant respectfully submits that claims 3, 4, 9 and 10 patentably distinguish over Grethe in view of Perera.

Regarding claim 8, the Examiner asserts that Grethe in view of Perera teaches all the limitations of the claim except for a shower head, which the Examiner asserts is disclosed by Jacob. Applicant respectfully disagrees.

For at least the reasons noted herein with respect to independent claim 1, Grethe fails to teach or suggest (i) "at least one secondary upper layer that substantially follows a second flow path radially inwardly towards said central axis, wherein said primary lower layer and said secondary upper layer interact and support each other in a non-destructive manner from peripheral side wall to said outlet;" (ii) "an inlet at or near said peripheral side wall to allow a flow of fluid to enter said chamber substantially tangential to said peripheral side wall;" and (iii) "an outlet exiting through one of said end walls wherein in use a flow of fluid entering through said inlet has a primary lower layer that substantially follows a first circular flow path which forms a vortex commencing at or near said peripheral side wall and increases in velocity and pressure towards said outlet," as recited by applicant's independent claim 1. Claim 8 is dependent, either directly or indirectly, upon independent claim 1 and thus is allowable for at least the reasons noted herein with respect to independent claim 1. For at least the foregoing reasons, Applicant respectfully submits that claim 8 patentably distinguishes over Grethe in view of Perera and/or Jacob.

CONCLUSION

Accordingly, for at least the stated reasons, it is respectfully submitted that the claim rejections under Section 112, 102(b) and 103(a) should be reconsidered and withdrawn. Applicant respectfully submits that all claims are in condition for allowance. Early and favorable action is earnestly solicited. If the Examiner believes that a telephone conversation may be useful in advancing prosecution of this application, the Examiner is invited to contact applicant's attorney at the number set forth below.

Respectfully submitted,

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